

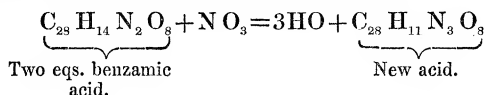
fractions of a per cent. of iron mixed with pure copper gave a higher conductivity than a nominally pure copper, with which the alloys were prepared. I must mention further, that in two series the alloys, both prepared by Messrs. Matthey and Johnson, and as I have been assured with equal care, gave results presenting considerable discrepancies; the conductivity of the pure copper in the first stood high, nearly agreeing with the 100 of my first scale, the pure copper of the second series fell considerably below that limit. On this account it appears that even pure copper, carefully prepared by the electrotype process, does not always give us results which show perfectly in point of conductivity; but to make such experiments in a satisfactory manner, it would be necessary to have a thorough chemical investigation, both synthetical and analytical, of the metals used; such a thorough investigation I have not been able to carry out, in consequence of the large expense which it would entail. I may mention that Mr. Matthiessen has gone through a series of experiments on alloys, of which the chemical composition has been ascertained with all possible accuracy, and has, I believe, arrived at highly important results relative to electrical conductivity. I have been in communication with him, and have supplied him with a specimen of one of my standards. He mentions to me that he has obtained specimens conducting better to a considerable extent than the 100 of my first scale. In that respect he has confirmed what I have myself ascertained, having myself found specimens as high as 111 on that scale. A number of alloys of definite chemical composition, prepared with great care by Mr. Calvert of Manchester, and already tested by him for thermal conductivity and for mechanical properties, have been put into my hands, in order that I may measure their electric conductivities. I hope soon to be able to obtain and publish results for this series of alloys.

III. "On a new Method of Substitution; and on the formation of Iodobenzoic, Iodotoluylic, and Iodanisic Acids." By P. GRIESS, Esq. Communicated by DR. Hofmann. Received January 3, 1860.

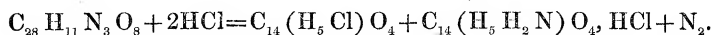
In a previous notice\* I have pointed out the existence of a new class

\* Proceedings of the Royal Society, vol. ix. p. 594.

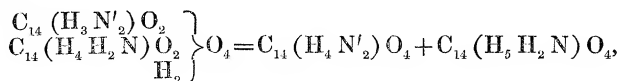
of nitrogenous acids which are generated by the action of nitrous acid on the amidic acids of the benzoic group, the change consisting in the substitution of one equivalent of nitrogen for three equivalents of hydrogen in two molecules of the amidic acid.



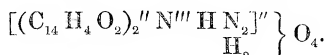
Under the influence of various agents these new acids undergo remarkable changes, amongst which the transformation produced by the mineral acids deserves to be particularly noticed. If the acid  $\text{C}_{28}\text{H}_{11}\text{N}_3\text{O}_8$  be gently heated with strong hydrochloric acid, nitrogen gas is evolved, the yellow colour of the original acid disappears, and a red body separates, which may be separated by filtration and purified by treatment with animal charcoal. Both the physical properties and the analysis of the substance thus obtained, prove it to be pure *chlorobenzoic acid*. The hydrochloric mother-liquor on evaporation deposits crystals of the *hydrochlorate of benzoic acid*.



To render intelligible this transformation, the acid  $\text{C}_{28}\text{H}_{11}\text{N}_3\text{O}_8$  may be viewed as a double acid corresponding to two molecules of water,



and splitting under the influence of hydrochloric acid into the two groups  $\text{C}_{14}(\text{H}_4\text{N}'_2)\text{O}_4$  and  $\text{C}_{14}(\text{H}_5\text{H}_2\text{N})\text{O}_4$ , in the first of which the two equivalents of monatomic nitrogen are replaced by hydrochloric acid, producing  $\text{C}_{14}(\text{H}_5\text{Cl})\text{O}_4$ , while the second simply combines with hydrochloric acid, producing hydrochlorate of benzoic acid. It deserves to be mentioned that the acid  $\text{C}_{28}\text{H}_{11}\text{N}_3\text{O}_8$  may be derived also from two equivalents of hydrated oxide of ammonium, when its formula assumes the following shape:—



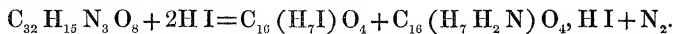
Further experiments are necessary to decide which of these two formulæ deserves the preference.

*Iodobenzoic Acid*,  $C_{14}(H_5 I) O_4$ .

This substance is produced by a process similar to that which furnishes the chlorobenzoic acid, viz. by the action of hydriodic acid on the acid  $C_{28} H_{11} N_3 O_8$ ,—beautiful white plates resembling benzoic acid, easily soluble in alcohol and in ether and difficultly soluble in water. Iodobenzoic acid is remarkable for its great stability; even fuming nitric acid fails to expel the iodine, and transforms the substance simply into nitro-iodobenzoic acid. The silver salt of iodobenzoic acid is a white amorphous precipitate containing  $C_{14} (H_4 I Ag) O_4$ .

*Iodotoluic Acid*,  $C_{16} (H_7 I) O_4$ .

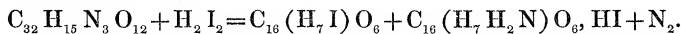
This acid is formed from the analogous nitrogenous acid in the toluic series, according to the equation



It crystallizes in white plates of a pearly lustre, which in their chemical and physical properties are very similar to iodobenzoic acid.

*Iodanisic Acid*,  $C_{16} (H_7 I) O_6$ 

is obtained by the action of hydriodic acid upon the nitrogenous acid  $C_{32} H_{15} N_3 O_{12}$ ,



Exceedingly small, nearly white needles, almost insoluble in boiling water, very soluble in alcohol and in ether.

The new method of substitution, by which the described products were obtained, although less direct than the ordinary processes, promises nevertheless to adapt itself to several cases of special interest. I am at present engaged in pursuing these experiments, with the view of producing fluo- and cyano-benzoic acids and their homologues, which have never been obtained.

The experiments which I have described were performed in Professor Hofmann's laboratory.